

*REMARKS/ARGUMENTS*

In response to the Office Action mailed April 25, 2005, Applicant amends his application and requests reconsideration. In this Amendment, claim 9 is cancelled and claim 10 is added so that claims 1-8 and 10 are now pending.

The Examiner raised a number of issues regarding formalities. Each issue has been responded to. A new title is supplied. Appropriate changes have been made in the specification at each of the locations identified by the Examiner. The word "Claim" in the dependent claims is no longer capitalized, although that capitalization is not objectionable. Claim 3 has been amended to correct an inadvertent omission.

The invention concerns an optical waveguide structure that includes optical waveguides within a semiconductor substrate. Those waveguides include curves, referred to as bent portions in some instances and as S-shaped portions elsewhere. In the first described embodiment, each of two optical waveguides has intersecting Y-branched parts that permit a lateral offset in the path along which light is propagating. For example, light P enters a waveguide 12, travels along the waveguide, and is reflected at a reflecting part 16a into a branch part of the second optical waveguide. The light then travels to a second reflecting part 16b where it is reflected and transmitted as outgoing light Q through the optical waveguide 1. Each of the reflecting parts 16a and 16b is disposed within a recess having, in plan view, a rectangular shape, within a semiconductor substrate 11. Each of the multiplexing ends 15 of the optical waveguides has a mirror surface, each of the light reflecting parts includes a rectangular recess in the substrate, and each of those light reflecting parts includes a reflecting film on a side surface of the respective rectangular recess. This arrangement with the recess is described in amended claim 1 and is supported in the description of the first embodiment, for example at pages 7 and 8 of the patent application.

The recess may also be filled with an insulating substance, as described in newly added claim 10. See the patent application at page 8, lines 4-7.

Claims 1, 4, 5, 7, and 8 were rejected as unpatentable over Miyagawa (JP 3-256028) in view of Furuyama (U.S. Patent 6,741,781).<sup>1</sup> This rejection is traversed for a very fundamental reason.

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<sup>1</sup> The family name of the inventor identified in the Japanese language reference is Miyagawa, his given name is Toshiya, the name employed by the Examiner in referring to this publication.

As emphasized, the invention concerns a semiconductor optical waveguide device including a semiconductor substrate. Neither Miyagawa nor Furuyama describes a semiconductor structure. In Miyagawa, the substrate is lithium niobate. See, for example, the identification of the substrate material in each of the three figures of Miyagawa. Lithium niobate is not a semiconductor material. Rather, lithium niobate has certain useful optical characteristics, including a strong electro-optical response. Likewise, Furuyama does not describe an optical device including a semiconductor substrate. Rather, as best understood, the substrate 1 may be silicon, ceramic, glass-reinforced epoxy or the like. While silicon is a semiconductor material, the materials employed for their optical characteristics in Furuyama are glasses and other conventional optical materials. Those materials are not semiconductors. No optical waveguide in Furuyama is within a semiconductor substrate. In citing Furuyama, the Examiner directed attention to Figures 17 and 18 and, according to the description in column 8 of Furuyama, the cladding layers 2 and 5 are glass-based materials or polymers. For the most fundamental of reasons, i.e., the absence of an important claim element from both Miyagawa and Furuyama, no combination of Miyagawa and Furuyama can establish *prima facie* obviousness of any claim now pending.

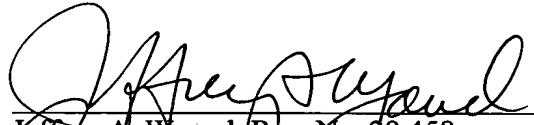
Further, the invention as defined by amended claim 1, including rectangular recesses in the semiconductor substrate, has no counterpart in any of the cited publications. As explained in the patent application, as well as in the amended claims, side surfaces of those recesses are part of the light reflecting parts. Accordingly, all claims are clearly patentable over all cited art.

Claims 2 and 3 were rejected as obvious over Miyagawa in view of Furuyama and further in view of Soldano. However, this rejection depends upon the propriety of the rejection of claim 1. As explained above, that rejection is erroneous so that the rejection based upon the addition of Soldano cannot properly be maintained.

Claim 6 was rejected as obvious over Miyagawa in view of Furuyama and further in view of the prior art described in the patent application. This rejection is likewise traversed because even if the limitation of claim 6 should be disclosed in the prior art described in the patent application itself, the rejection is founded upon the rejection of claim 1, a rejection that can no longer be maintained.

Reconsideration and allowance of all of the claims now pending are earnestly solicited.

Respectfully submitted,



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JAW:yes

